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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,546	11/01/2005	Kenichiro Nakajima	Q71952	1419
23373 7590 06/05/2008 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER BENNETT, TYLER N	
			ART UNIT 4132	PAPER NUMBER
			MAIL DATE 06/05/2008	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/524,546

**Applicant(s)**

NAKAJIMA, KENICHIRO

**Examiner**

TYLER N. BENNETT

**Art Unit**

4132

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/88)  
Paper No(s)/Mail Date See Continuation Sheet
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

Continuation of Attachment(s) 3. Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :2/14/2005, 11/01/2005, 9/26/2006, 10/26/2007.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2, 6 and 9-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claim 2, it is unclear what Applicant means by "as measured within a range of a temperature of the melt to 800°C". Applicant is asked to clarify.

As to claim 6, it is unclear what Applicant means by "and further contains a phase, other than the filled skutterudite phase, having a maximum diameter of 10 um or less". Applicant is asked to clarify. The limitation was interpreted to mean the maximum grain diameter, and has been examined as such.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 5, 6 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Kitagawa et al. (Microstructures and Thermoelectric Properties of  $(\text{FeSb}_3)_{1-x}\text{La}_x$  Ribbons, 17<sup>th</sup> Inter. Conf. on Therm., 1998, pgs 334-337).

As to claim 1, the reference teaches a method for producing a filled skutterudite-based alloy (page 334, 1:14), comprising:

- melting alloy raw material of La, Fe and SB (p. 334, 2:5) to form a melt (p. 334, 2:10); and
- rapidly quenching the melt through strip casting (spin-cast, p. 334, 1:43) to form a solidified product (p. 334, 2:10).

Regarding claim 5, the reference teaches that the skutterudite-based alloy contains a filled skutterudite phase in an amount of 100 mass % (p. 335, 2:9 and Fig. 5). The examiner notes that even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself (see MPEP 2113).

Regarding claim 6, the reference teaches a filled skutterudite phase in an amount of at least 95 vol. % (p. 335, 2:9 and Fig. 5) and a phase, other than the filled skutterudite phase, having a maximum grain diameter of 10  $\mu\text{m}$  or less (Fig. 2, Fig. 3 and p. 335, 2:16-20). The examiner notes that even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself (see MPEP 2113).

Regarding claim 8, the reference teaches a thermoelectric element fabricated using the filled skutterudite-based alloy (p. 335, 1:1-6).

#### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 4132

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitagawa et al. as applied to claims 1 and 5 above.

As to claim 3, the reference teaches that the alloy raw material is melted in an inert gas atmosphere (argon atmosphere, p. 334, 2:10), but is silent as to the specific atmospheric pressure. One reading Kitagawa et al. would appreciate that the reference is not concerned with a particular pressure of the argon atmosphere and therefore selection of a particular pressure would have been within purview of one of ordinary skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to melt the alloy raw material in an inert gas atmosphere at a pressure higher than 0.1 MPa and not higher than 0.2 MPa, because adjusting the argon pressure as necessary would minimize defects in the metal ribbons and would have been within purview of one skilled in the art.

As to claim 7, the reference teaches that the percentage of atoms in the metal alloy ribbons are 100% LaFe<sub>4</sub>Sb<sub>12</sub> (p. 335, 2:9) and that the individual metals were

melted in an inert atmosphere (argon, p. 334, 2:10), but is silent as to the content of oxygen, nitrogen and carbon being in a total amount of 0.2 mass% or less. The examiner notes that since the percentage of atoms belonging to the metal ribbon is 100%  $\text{LaFe}_4\text{Sb}_{12}$ , it would have been obvious to one having ordinary skill in the art to expect that the content of oxygen, nitrogen and carbon is in a total amount of 0.2 mass% or less. The examiner notes that even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself (see MPEP 2113).

8. Claims 2, 4, and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitagawa et al. as applied to claims 1 and 5 above, and further in view of Hirota et al. (EP 1030317 A2) and Lange (Lange's Handbook of Chemistry, 15<sup>th</sup> Edition, Table 3.2).

As to claim 2, Kitagawa et al. teach that the alloy raw material is melted in a high frequency induction furnace (p. 334, 2:7-9) and rapidly solidified (p. 334, 2:10-11) via strip casting on a copper roll (p. 334, 2:9-10), but is silent as to a specific melting temperature of 800-1800 °C and a cooling rate of  $10^2$  to  $10^4$  °C/second.

Kitagawa et al. teach that pure Fe, Sb and La were weighed and melted together (p. 334, 2:4-6). The melting points of Fe, Sb and La are 1535 °C, 630.7 °C and 920 °C, respectively (see Lange's Handbook). One skilled in the art would appreciate that the three metals would need to be heated to a minimum of 1535 °C to ensure complete melting of the metals. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to heat the metals of Kitagawa et al. to at least 1535

Art Unit: 4132

°C, as this temperature would allow for sufficient melting, and therefore mixing, of the three metals and allow one skilled in the art to obtain the desired metal compositions.

It is known in the art of strip casting rare earth alloys (abstract) to quench the melted metal at a cooling rate of  $10^2$  to  $10^4$  °C/second, as taught by Hirota et al. [0027], wherein the metallographic phase structure of the alloy in the form of a thin ribbon can be controlled by adequately selecting the quenching conditions (i.e. cooling rate) of the alloy melt [0006].

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a cooling rate of  $10^2$  to  $10^4$  °C/second in the strip casting method of Kitagawa et al. because doing so allows for better control of the phase structure of the alloy melt, as taught by Hirota et al. [0006], resulting in a thermoelectric device with improved selection of properties.

As to claim 4, Kitagawa et al. teach forming strips (ribbons) with a thickness of 20  $\mu$ m (0.02 mm, p. 334, 2:11), but is silent as to the thickness being 0.1 to 2.0 mm. In *Gardner v TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. One of ordinary skill in the art at the time of the invention would have been able to select an appropriate thickness/size based on the desired properties of the thermoelectric device.



As to claim 9, Kitagawa et al. in view of Hirota et al. teach that the alloy raw material is melted in an inert gas atmosphere (Kitagawa et al., argon atmosphere, p. 334, 2:10), but is silent as to the specific atmospheric pressure. One reading Kitagawa et al. would appreciate that the reference is not concerned with a particular pressure of the argon atmosphere and therefore selection of a particular pressure would have been within purview of one of ordinary skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to melt the alloy raw material in an inert gas atmosphere at a pressure higher than 0.1 MPa and not higher than 0.2 MPa, because adjusting the argon pressure as necessary would minimize defects in the metal ribbons and would have been within purview of one skilled in the art. The examiner notes that even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself (see MPEP 2113).

As to claim 10, Kitagawa et al. in view of Hirota et al. teach that the percentage of atoms in the metal alloy ribbons are 100%  $\text{LaFe}_4\text{Sb}_{12}$  (Kitagawa et al., p. 335, 2:9) and that the individual metals were melted in an inert atmosphere (Kitagawa et al., argon, p. 334, 2:10), but is silent as to the content of oxygen, nitrogen and carbon being in a total amount of 0.2 mass% or less. The examiner notes that since the percentage of atoms belonging to the metal ribbon is 100%  $\text{LaFe}_4\text{Sb}_{12}$ , it would have been obvious to one having ordinary skill in the art to expect that the content of oxygen, nitrogen and carbon is in a total amount of 0.2 mass% or less.

#### ***Double Patenting***

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

Art Unit: 4132

unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 1-10 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-22 of copending Application No. 10531480 (hereafter referred to as '480). Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of '480 encompass all of the limitations of the instant claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

#### **Correspondence/Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TYLER N. BENNETT whose telephone number is (571)270-5260. The examiner can normally be reached on Mon-Thurs 0730-1700.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on 571-272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/T. N. B./  
Examiner, Art Unit 4132

/Jessica L. Ward/  
Supervisory Patent Examiner, Art Unit 4132